Policy Options for Reducing CO_2 Emissions from CA Cement

Ned Helme, President
David Wagger, Policy Analyst
Center for Clean Air Policy

California Energy Commission
Climate Change Advisory Committee
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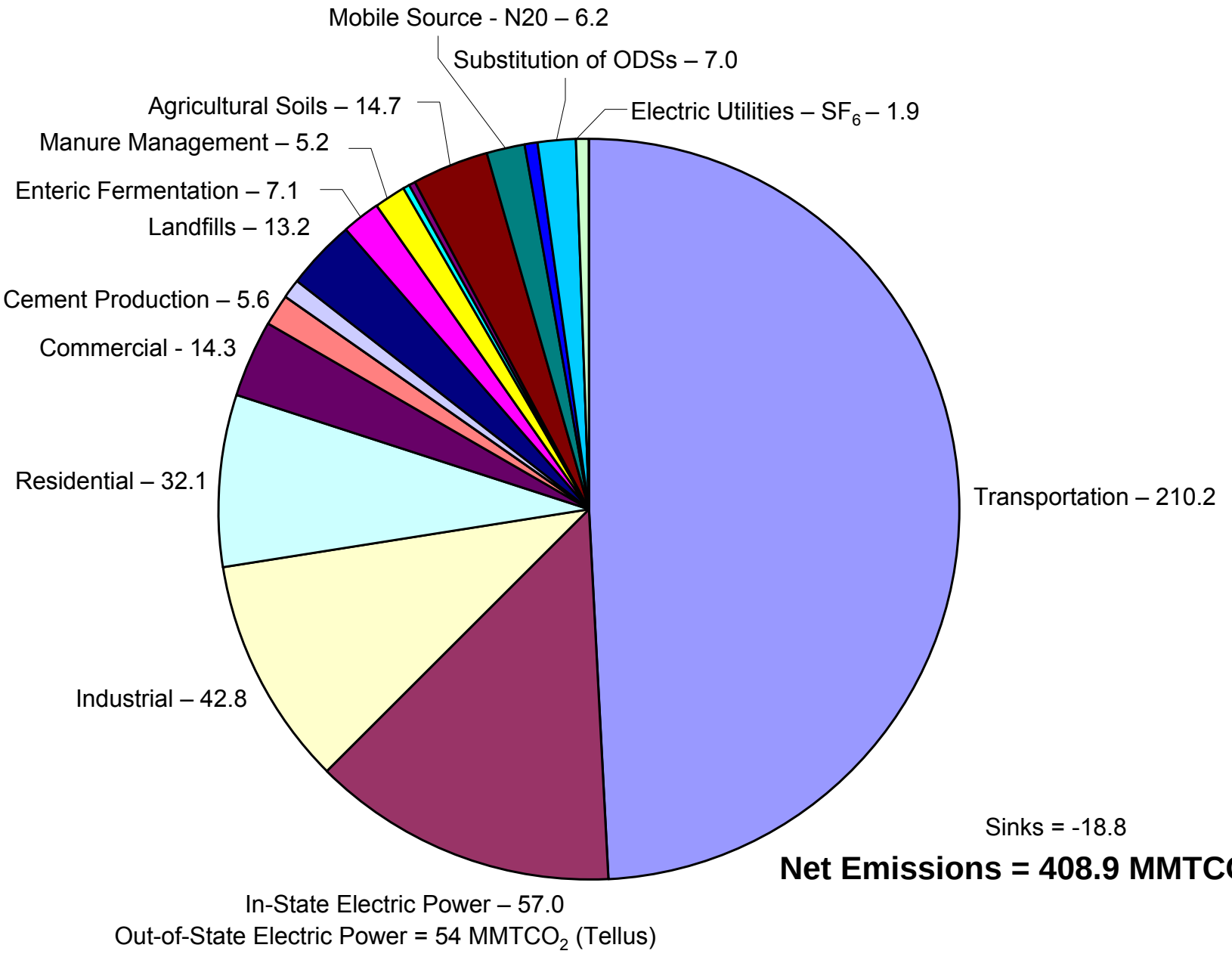
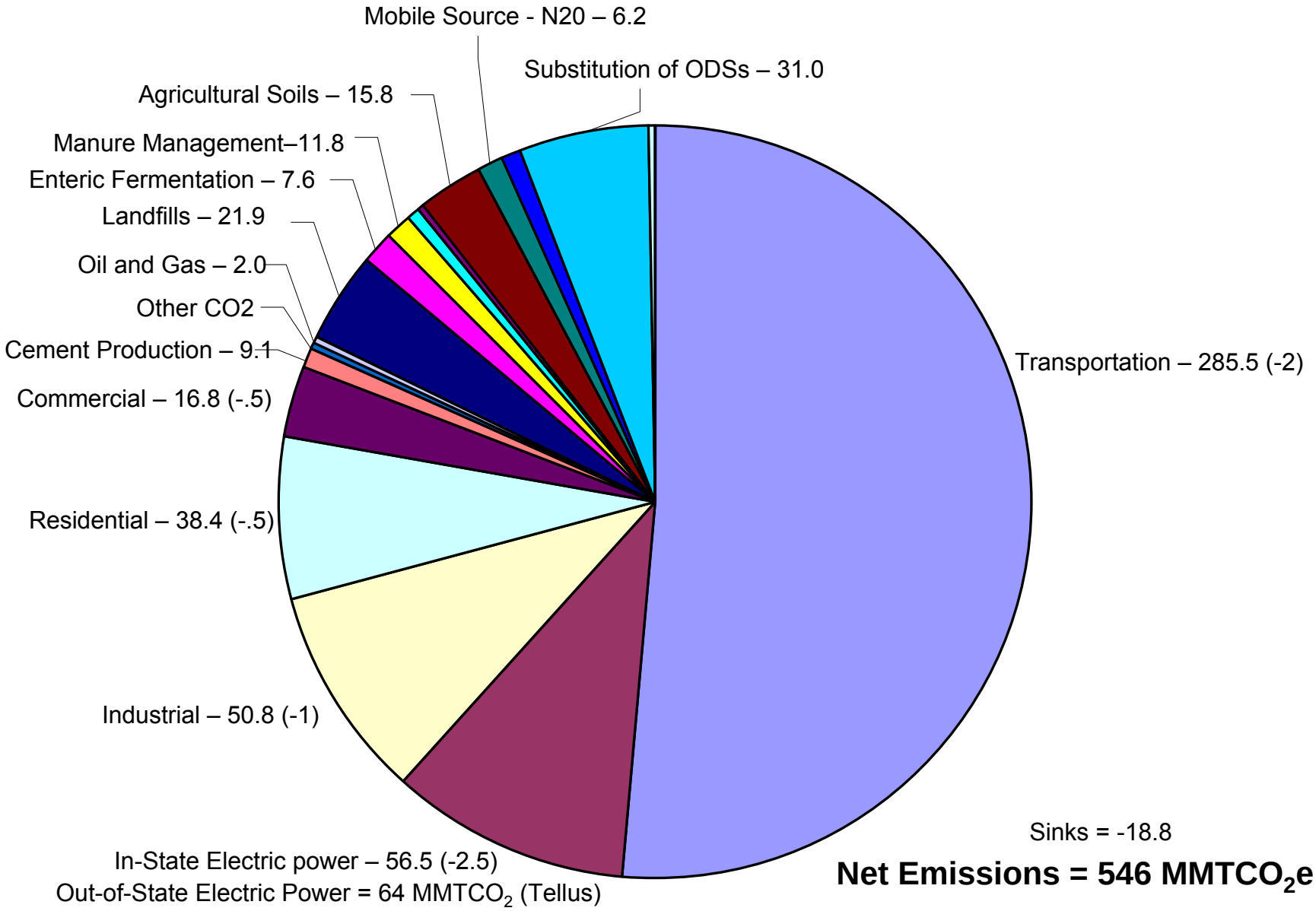
CA GHG Inventory – 1999 (Gross Emissions = 427.7 $MMTCO_2e$)



Est. CA GHG Projections – 2020 (Gross Emissions = 564 $MMTCO_2e$)

Assumes 6.5 MMTCEs reduced from recent policies (shown in parentheses).



Net Emissions = 546 $MMTCO_2e$

Note: In-state and out-of-state power emissions may be larger than shown due to demand changes.

Elements of CCAP's CA Cement Analysis

1. Future baselines of clinker and cement capacities and output
2. Future baselines of associated fuel and electricity consumption
3. Future baselines for CO_2 emissions from fuel, electricity, and limestone consumption
4. Information on benefits, costs, and technical potentials of energy-efficiency (EE) and other measures to reduce energy consumption and CO_2 emissions from clinker and cement
5. Potential cumulative reductions in energy consumption and CO_2 emissions from measure implementation and their cumulative net costs
6. Abatement-cost curves for cumulative direct CO_2 emissions
7. Projections of future annual direct CO_2 emissions under various amounts of measure implementation

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Key Data Sources and Assumptions

- Growth rate of 2% were used based on discussions with representatives from the cement industry and based on knowledge of national growth statistics.
- Future baselines for fuel and electricity consumption were based on a combination of national and California specific data, with assumptions on improvements in energy efficiency consistent with historical trends.
- CO_2 emission factors were taken from EPA documents, especially the Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2002.
- Indirect factor for electricity based on average grid electricity consumed in California, derived from projections in EIA's Annual Energy Outlook 2005.
- Information on the benefits, costs and technical potentials of various measures are from publicly available reports by the Lawrence Berkeley National Laboratory (LBNL) as well as from a more recent draft LBNL report for the California Energy Commission.
- For additional details, see memo dated March 30, 2005.

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Result of Cement Analysis (1)

- Baseline annual direct CO_2 emissions to increase from 10.4 to 15.1 $MMTCO_2$ from 2005 to 2025 (2% annual sector growth)
  - 11.3 (2010), 13.6 (2020), and 263 (2005–2025) $MMTCO_2$
  - 1% sector growth lowers baseline by ~12% relative to 2% growth.
- 47 $MMTCO_2$ in potential cumulative reductions from baseline
  - 38 $MMTCO_2$ from measures costing ≤$10/MT (7% discount)
  - 36 $MMTCO_2$ from measures costing ≤$5/MT (7% discount)
  - 20 $MMTCO_2$ from measures costing ≤$0/MT (7% discount)
  - Little effect at ≤$10/MT and ≤$5/MT by 4% and 20% discount rates
  - 1% sector growth lowers reductions by 5–10% relative to 2% growth.
- At best, annual emissions to return to initial value by 2017 and exceed it by 2.2 $MMTCO_2$ in 2025, reaching 12.6 $MMTCO_2$

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Result of Cement Analysis (2)

- 70% of cumulative emissions reductions from 2 measures
  - Limestone Portland Cement: 12.6 $MMTCO_2$ at ($21)/MT (savings)
  - Blended Cement: 14.0 $MMTCO_2$ at $2.40/MT
- Possible 3.6-$MMTCO_2$ reduction from Waste Tire Fuel at ($14)/MT (savings), but dependent upon current waste-tire use
- All 3 measures have market barriers to implementation
  - Limestone Portland Cement: Market acceptance
  - Blended Cement: Cement standards
  - Waste Tire Fuel: Public resistance
- State policies need to address these market barriers to enable emissions reductions from CA cement sector

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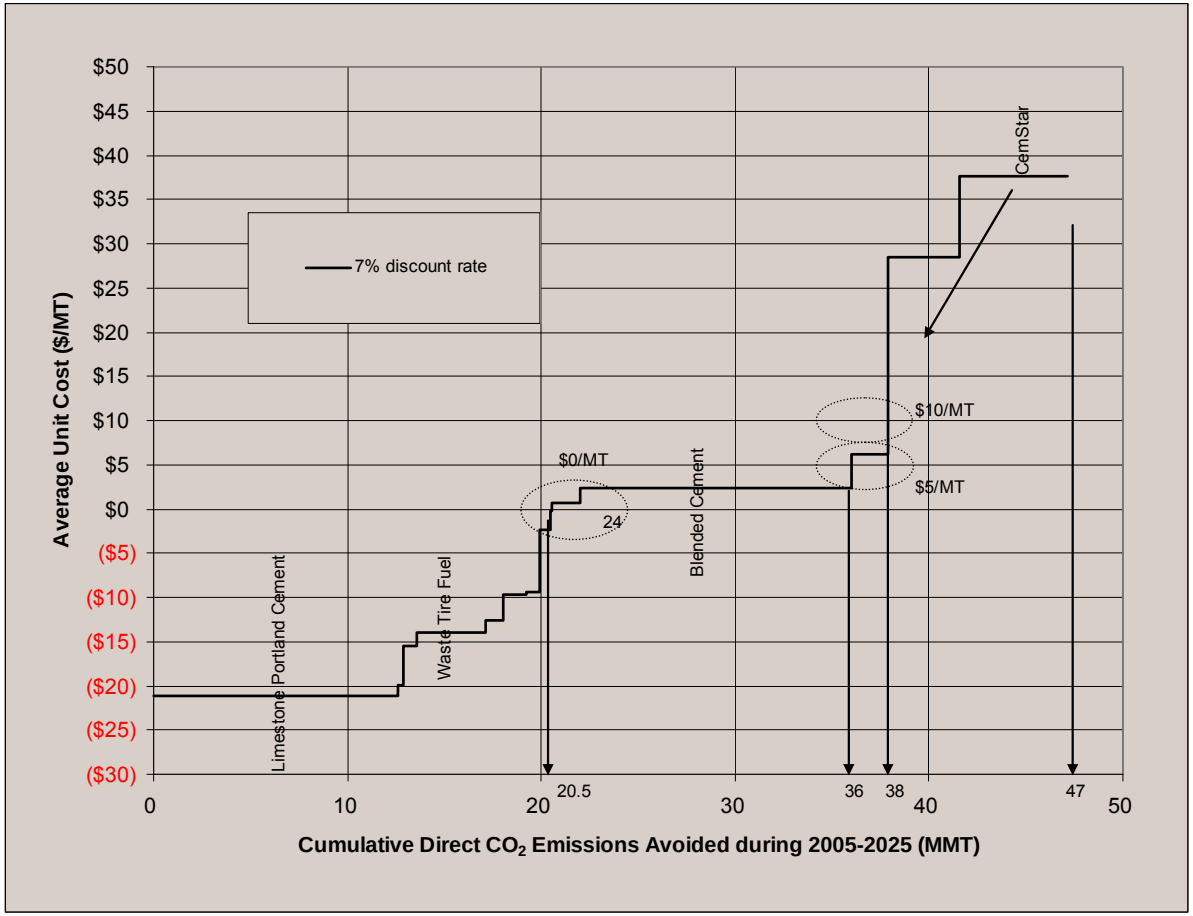
Abatement-Cost Curve for CA Cement Sector
(2% Annual Sector Growth, 7% Discount Rate)



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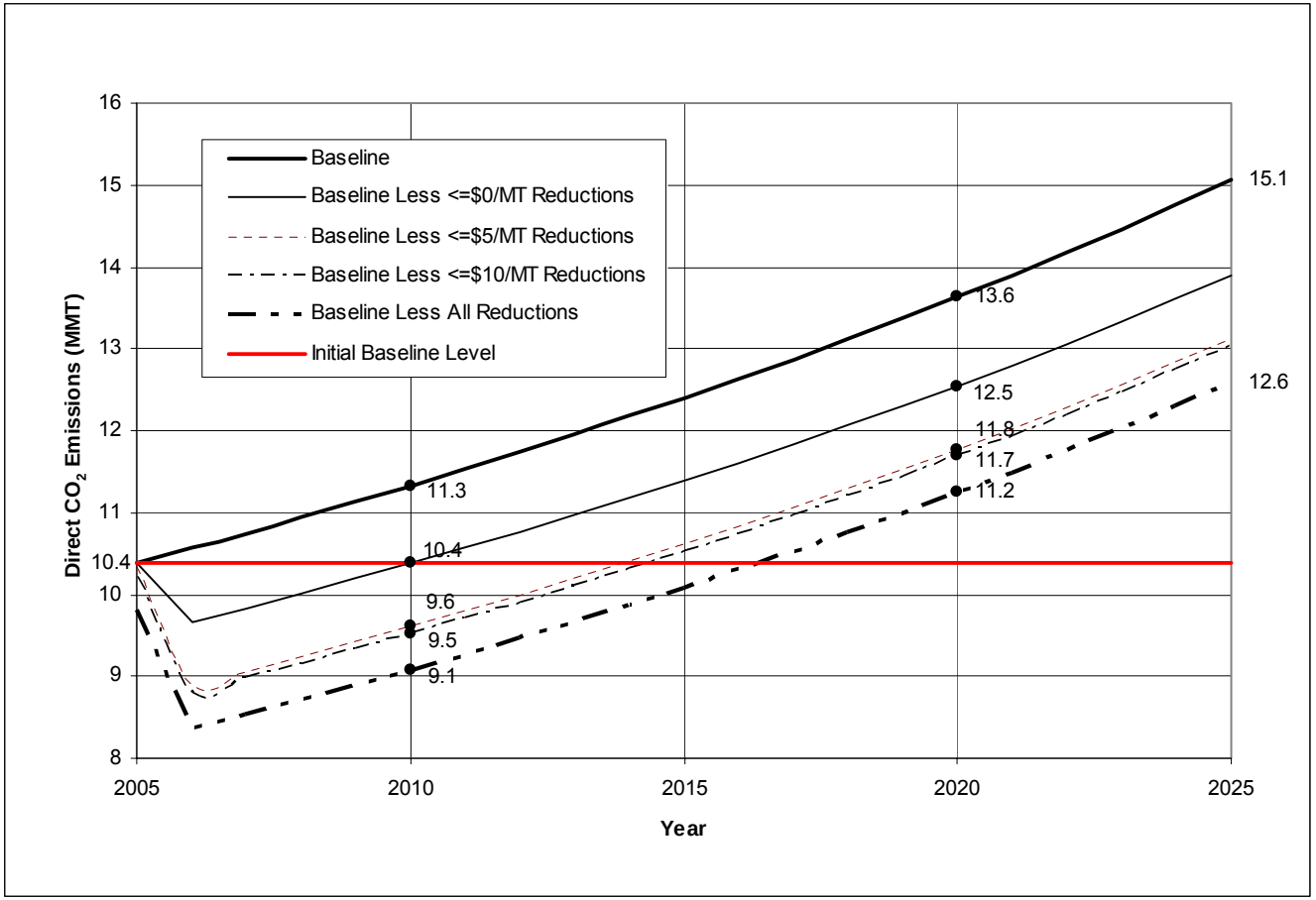
Projected Future Direct Emissions from CA Cement Sector (2% Annual Sector Growth)



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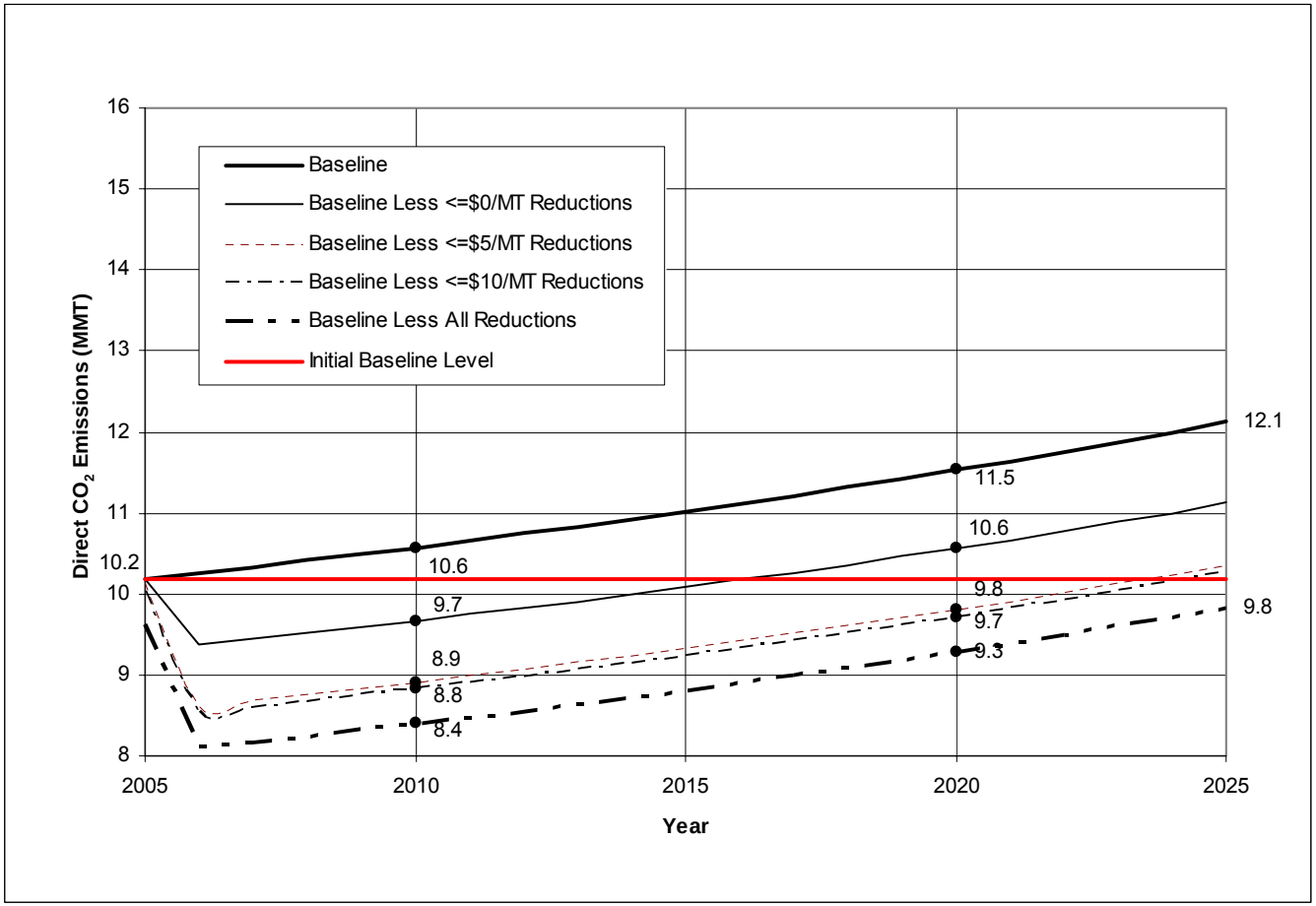
Projected Future Direct Emissions from CA Cement Sector (1% Annual Sector Growth; 100% of Measure Benefits)



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Policy Options for Reducing CO_2 Emissions from CA Cement Sector (1)

Form	Advantages	Disadvantages
Technology Mandates	Sector participation	Less flexibility; Less innovation; Potentially high compliance costs
Direct Cost-Sharing with Public Funds	Financial incentives; Voluntary participation	Public, other sector disapproval; Susceptible to budget process
Indirect Cost-Sharing via Tax Code		Public, other sector disapproval; Ineffective distribution of financial incentives
Negotiated Agreements	Flexibility	Potential for weak and/or uneven agreements across sector
Emissions-Intensity Benchmarking	Sector participation	Absolute emission increases possible
Cap-&-Trade System[1]	Sector participation (1,2); Emissions Target (1,2); Flexibility (1)	Cap perceived as restriction on sector growth (1,2); Less flexibility, higher costs than Cap-&-Trade (2); Greater need to get cap level(s) right (2)
Cap Only System[2]		

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Policy Options for Reducing CO_2 Emissions from CA Cement Sector (2)

- Regardless of policy option selected, policies are needed to lower or remove barriers to using Limestone Portland Cement, Blended Cement, and Waste Tire Fuel.
  - Codify use of Limestone Portland Cement and Blended Cement in public-works projects and encourage their use in the private sector
  - Take more active role in explaining and demonstrating to the public the benefits from using Waste Tire Fuel instead of coal in cement kilns

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Conclusions

- Various cost-effective options are available to the cement sector, including measures costing less than $0, $5 and $10 per ton CO_2.
- With 2% per year growth rate assumption, it will be difficult to reduce the growth in emissions to 2000 levels by 2020.
  - » Results are sensitive to this assumption, which was taken from the industry's representation of national growth rates.
- Policies are needed to encourage use of limestone and blended cements, the two major reduction options identified. Financial incentives may play a smaller role for this sector.
- A variety of voluntary or mandatory policy approaches could be used to encourage CO_2 reductions from cement, depending on the group's later assessment of whether reductions from this sector are needed to meet a statewide reduction goal.

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Questions for Discussion

- Assumptions about the growth rate are critical to setting a target for this sector. What additional work, if any, should be done to evaluate the expected growth rate for the cement industry in California?
- Which voluntary and mandatory implementation options should be examined in detail for further discussion?

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